Aeronautics Research Advisory Committee

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NASA Headquarters
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Meeting Report

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Opening Remarks
G. Michael Green, Executive Director of the Aeronautics Research Advisory Committee (ARAC), began by introducing the new ARAC Chair, James Jamieson. Mr. Green also recognized Jaiwon Shin, the new Deputy Associate Administrator for Aeronautics, and Herman Reiess, the recently appointed Director of University Programs. It was noted that long-time member Robert Spitzer was retiring from Boeing and the ARAC.

Turning to the calendar, Mr. Green indicated that the joint meeting of the ARAC with the Research, Engineering, and Development Advisory Committee (REDAC) had been postponed until September 20-21, 2005. Meanwhile the NASA Advisory Committee (NAC) would convene December 7-8, 2004, and the next Aeronautics and Space Engineering Board meeting would occur November 3-4 in downtown Washington.

After making logistical announcements and requesting member introductions, Mr. Green turned the session over to Mr. Jamieson. The new Chair commented on the current flux within NASA and his sense that the change would make the agency better. He also gave credit to the accomplishments to his predecessor, David Swain, and expressed his eagerness to work with the committee.

Victor Lebacqz's Overview of the NASA Transformation
Associate Administrator Lebacqz first observed that NASA's redefined focus on space exploration had left the agency's primary vision and mission in tact. There was still a mandate to protect and improve life on the home planet, which formed the basic rationale for Aeronautics programs. Dr. Lebacqz pointed out that the technologies in these programs could also enable the exploration of the universe and the search for new life. His presentation included photographs taken from current robotic missions to Mars (rovers) and Saturn (Cassini).

Dr. Lebacqz next highlighted the changes spurred by the recent Aldridge Commission report. One involved the transformation of the agency's seven "stove-pipe" enterprises into four mission directorates, including Aeronautics. Other thrusts emphasized greater private-sector involvement in space operations and more reliance on performance-oriented goals. There was also the perception that a new model was needed for NASA's field centers-perhaps in the form of federally funded research and development centers (FFRDCs). (Dr. Lebacqz noted that his office had already sent out a request for information [RFI] on this issue and that a review team would soon report what it had learned from 30 responses.) The commission had made a further recommendation to institutionalize practices similar those used in pioneering work by the Defense Advanced Research Projects Agency (DARPA).

The presentation homed in on the transformation of the agency's overall structure. The agency's new mission directorates would be headed by Associate Administrators Lebacqz (Aeronautics), William Readdy (Space Operations), Craig Steidle (Exploration Systems), and Al Diaz (Science). Under these mission areas fell 6 support offices—Chief Financial Officer (CFO), Chief Information Officer (CIO), Chief Engineer, Institutions and Management, General Counsel, and Chief of Strategic Communications—that had

been consolidated from 17 separate codes in the old regime. To streamline further, the agency had replaced the old Executive Council of two dozen members with two new bodies: the Operations Council (processing and filtering day-to-day activities) and the Strategic Planning Council (reviewing top-level issues every 2 weeks). The Administrator and Deputy Administrator sat on the Strategic Planning Council, as did the directorate heads, the Association Deputy Administrator for Systems Integration (Mary Kicza), and the Associate Administrator for Institutions and Management (Jim Jennings). Such a relatively small group represented a major shift from the composition of the previous Executive Council.

Dr. Lebacqz briefly discussed Ms. Kicza's pivotal integrative role, as well as that of fellow strategic thinker Charles Elachi, Director of Advanced Planning. These two had formed an office to develop a dozen agency roadmaps with input from the systems analysis organization resident at Langley Research Center. Ms. Kicza would also be evaluating NASA's core competencies in light of the new roadmaps.

The presentation shifted again to the future of the NASA centers. Aeronautics would retain its research infrastructure at Glenn, Langley, and Dryden but would give up direct program oversight of Ames, where aviation research represented less than 20 percent of the budget. (Aeronautics still could have input into Ames decision-making, however.) The reporting function of the different centers was still being worked out, with a wide spectrum of models being considered, including FFRDCs and traditional management linkages to Headquarters. Aeronautics had an obvious requirement to maintain key facilities such as certain wind tunnels, as well as core competencies in enabling technologies. Dr. Lebacqz indicated, however, that it was still unclear how to institutionalize and fund the needed changes. Whether the centers would be encouraged to enter into public or private R&D partnerships also remained uncertain. Notable changes, though, had already taken place. For example, all center CFOs now reported directly to the agency's CFO rather than to their center directors.

Dr. Lebacqz briefly reported on the development of the Exploration Systems Mission Directorate, which Frank Cappuccio and others thought would be run as a straightforward program by Adm. Steidle. Dr. Lebacqz noted that Adm. Steidle had already assembled 11 teams to work on concepts and have involved many more people—including those outside the aerospace and national community—in the initial development stage. These efforts represented a definite response to the Aldridge Commission recommendation to broaden input into NASA's operations.

In the budget arena, Dr. Lebacqz indicated that the agency had "gone to green" on Human Capital and Budget within the management agenda, and was making headway on Financial Integration and Procurement. The biggest challenge was proving to be Financial Management. He also noted that NASA had set aside $10-20 million in its FY04 budget for the Centennial Challenges Prize to foster innovation in aeronautics, much as the X Prize already was doing. At one point he showed current and projected budget totals across his directorate. The falloff after FY04 reflected that year's earmarks, as well as the closeout of Advanced Air Transportation Technologies (AATT) program.

Those items being taken into account, the funding stream promised to be stable in the years ahead.

Returning to the roadmapping process, Dr. Lebacqz traced the origins of the roadmapping areas—fluctuating in number between 11 and 13. Eight of these were derived directly from the Aldridge Commission report, while most of the others related to the Science Mission Directorate. No. 11, however, was specific to Aeronautics: "To provide advanced aeronautical technologies to meet the challenges of the next generation systems in aviation for civilian and scientific purposes, in our atmosphere and in those of other worlds." Taking this as its Level 0 requirement, Aeronautics could report that its program plans were generally in good shape, with Vehicle Systems having undergone extensive review and Air Space Systems benefiting from the ongoing work of the Joint Planning and Development Office (JPDO). He noted that Mr. Jamieson would serve as the external cochair on the Aeronautics roadmapping committee.

Dr. Lebacqz noted that success was still measured by technology transfer in most cases. Jeffrey Wieringa asked how NASA measured and credited such transfer. Dr. Lebacqz replied that in air traffic management, adoption by the Federal Aviation Administration (FAA) defined the metric. The JPDO was trying to identify how best to facilitate the transfer. In other areas, such as noise reduction, transfer could be understood on a case-by-case basis. He said that he wanted to give more thought to formalizing the assessment.

Having earlier described agency-wide transformation, Dr. Lebacqz outlined the structure of the new Aeronautics Research Mission Directorate (ARMD). The key program areas remained: Vehicle Systems, Safety and Security, and Airspace Systems. The heads of these programs reported directly to the front office, which included the Associate Administrator and the Deputies for Operations and Technology. Under them functioned the various support divisions, such as Planning and Partnerships, Resource Management (three field centers), Mission Support, and Strategic Communications.

Planning and Partnership activities received special comment. Dr. Lebacqz reported a good relationship with the FAA thanks to the ongoing work of NASA liaison Chuck Johnson and NASA detailee Robert Pearce at the JPDO. With the Department of Homeland Security (DHS), NASA was trying to develop a memorandum of understanding (MOU) regarding specific technologies. For each such arrangement it was important to identify one key person as the link between agencies. With the Department of Defense (DOD), the partnership process had faltered for a variety of reasons, including breakdowns in joint rotorcraft and hypersonics research.

Next, Dr. Lebacqz briefly addressed each of the directorate's continuing program goals. His first priority remained the enabling of the JPDO plan to transform the Nations' airspace. Aviation safety and security figured prominently among his goals as well, with important work on noise and emissions continuing at Langley and with improved connections developing with DHS. Meanwhile, unscrewed aerial vehicles (UAVs) had warranted greater allocations in the FY06 budget because of their promise for remote sensing and space exploration. Supersonic aircraft still deserved investment because of

progress being made, especially through tests of the modified F-5. Funding for air-breathing space exploration vehicles had increased because they could perform reconnaissance functions not possible with rovers or satellites. Finally, ARMD was maintaining its interest in hypersonics, if only in a limited way in fundamental research.

Followup Discussion.
Thomas Brackey suggested that it was short sighted to judge program success simply in terms of user applications. Dr. Lebacqz replied that use often did define success, but that to break through boundaries, it was sometimes necessary to make investments and take risks without an immediate application in sight. Hypersonics represented a case in point. The new exploration initiative, however, did not call for such advanced air-breathing vehicles. Mr. Cappuccio likewise noted that in other areas such as defense and security, ultra-high speed appeared to offer little immediate payoff to stakeholders. In the long term, however, he and Mark Anderson agreed that the advantages of hypersonics would become apparent. Dr. Lebacqz noted how such aircraft represented the margins of aerodynamic and propulsion theory. Mr. Anderson, however, questioned whether the $15-20 million envisioned for hypersoncis represented an appropriate investment. Dr. Lebacqz said he was willing to reconsider his prioritization of this technology.

Mr. Cappuccio asked for additional insight into NASA's rift with the Air Force. Dr. Lebacqz commented about the importance of rebuilding that partnership. He had already visited AFRL and was about to make another trip there. The Air Force needed technology that NASA could provide. Such requirements could help drive what NASA did.

Mr. Anderson asked how much funding Aeronautics really needed to do what it wanted to do. Dr. Lebacqz replied that a number of highly regarded reports had already identified technology and investment gaps within the field and that the necessary funding needed to be sorted out according to these requirements. It might be just $1 billion, or it might be much more. Mr. Cappuccio suggested that Aeronautics tap into thehomeland defense theme as a strategy to gain more funding. William Hoover recommended that civil aeronautics learn from DOD and gain credibility from a recognized requirements process.

Dr. Lebacqz concluded his remarks by saying that he would not support proposals that were hostile or indifferent to the new exploration directive; aeronautics needed to demonstrate its usefulness to or compatibility with space exploration. He also noted that he would be bringing more people into ARAC from the airlines and Council of Deans.

Awards.
Before the beginning of the next presentation, Dr. Lebacqz awarded plaques to Dr. Brackey and Dr. Dev Banerjee for their service to ARAC (formerly ATAC) and its serval subcommittees.

Mr. Pearce's Update on the JPDO

After distributing a near-final draft on the JPDO plan and soliciting ARAC feedback, Mr. Pearce traced the background of his office and mission, which originated 2 years ago and received Congressional authorization last year. Although the law called for an integrated plan for the next airspace system, the scope of the legislation had yet to be fully resolved. To date, a nearby administrative office (1500 K Street, N.W.) had opened and a Senior Policy Committee, chaired by Transportation Secretary Minetta, had convened twice; a third meeting was soon to take place. Top executives from the FAA, NASA, the Department of Commerce (DOC), DOD, and DHS sat on the committee. Charlie Keegan had replaced John Kern as JPDO Director, and Mr. Pearce remained Deputy Director. The joint office was structurally housed within the FAA.

Mr. Pearce outlined the growing incongruities that necessitated airspace system transformation. Foremost was the gap between system capacity and passenger demand, with the inevitable consequence of long delays already exacerbated by additional security requirements. The increasing diversity of vehicles, including UAVs and very light jets (VLJs), would also add strain to operations and ground facilities. The main challenge was to reconfigure the system with appropriate technologies and strike a balance between human controls and automation. Toward this end, the JPDO was developing models to simulate the system end to end. Unlike the past, NASA was working to line up calibration, scenarios, and models across agencies and was taking a leadership role on the JPDO modeling team.

The presentation shifted to the basic elements of the new plan. Mr. Pearce first addressed the principal goals of the JPDO. These included retention of U.S. leadership in global aviation, threefold expansion of system capacity, and maintenance of aviation safety (including noise and emission controls) during the transition. National defense and homeland security also figured prominently among the office's goals. These goals were associated with a set of performance characteristics, such as passenger and cargo growth, routine use of UAVs, on-demand air taxis, continued point-to-point service growth, and demand for commercial space launches.

A discussion ensued about the growth and impact of VLJs. Mr. Anderson and Ron Swanda questioned whether such aircraft would constitute 40 percent of system operations by 2025. Gen. Hoover noted that VLJs created another safety issue. Mr. Pearce acknowledged their safety and environmental impacts, especially as these jets moved into smaller communities unaccustomed to such traffic. The airspace system would need to accommodate not only these new aircraft, however; UAVs and any supersonic vehicles could place even more strain in certain areas.

Mr. Pearce also briefly discussed the operational concepts addressed in the JPDO plan. These encompassed security, safety, aircraft and airport operations, weather, environment, and international harmonization. Overall, it was important to fully exploit the capabilities already being built into today's aircraft and to move toward performance-

based services. Planners needed to ensure that procedures and systems were not tied to geography underneath the airspace. This would require standardization and automation of functions, with all key players—airlines, agencies, etc—in the civil system operating from a common information base.

Turning to project implementation, Mr. Pearce observed that the contributing agencies, not the JPDO, controlled the resources to execute the developing plan. To make this arrangement work, the JPDO was coordinating eight integrated product teams (IPTs) focused on different areas and assigned to individual agencies for primary responsibility. The FAA was assigned four IPTs dealing with airport infrastructure, safety management (certification), environment, and global harmonization. The other JPDO agencies were allocated one IPT each: DHS, security; NASA, air traffic management; DOD, situational awareness; and DOC, weather. Someone from NASA, however, would be represented on each team.

The long-term schedule called for an integrated program infrastructure by 2007, the point at which another level of funding would be required to advance the plan. By 2012, the necessary fundamental research needed to have been performed and the implementation policies needed to have been put in place. After that, the bulk of the work consisted of plan execution.

A discussion arose about present capabilities of the JPDO's modeling efforts. Dr. Lebacqz suggested that the ARAC might visit the JPDO office during the next committee meeting to learn more about modeling operations. Mr. Pearce answered affirmatively to several questions from Mr. Anderson about the ability of today's models to represent the current airspace system, the results of introducing various goals and performance outcomes, and the impact of new technologies on outcomes. Dr. Lebacqz noted that the Virtual Airspace Modeling and Simulation (VAMS) project addressed many of these issues. Terrence Hertz, however, cautioned against focusing just on VAMS. It represented only one of many components in the overall modeling effort. JPDO's biggest step in this area had been to address tool calibration. A true end-to-end model predicting curve-to-curve impacts of parameter changes, however, did not yet exist. Modelers had made the greatest advances in weather forecasting. Eventually every area—aircraft, terminals, security—would be modeled. Mr. Pearce noted that many organizations operated models on various parts of the overall system. One major challenge was to examine these side by side with respect to assumptions and output and then to calibrate them. The next big challenge was to integrate these end to end so that modelers could see how changes rippled throughout the system. Dr. Brackey expressed concern about how such integration and validation would take place.

The discussion shifted to strategies for achieving multiagency implementation. Mr. Cappuccio asked what the JPDO could do to prevent the eight agency-based teams from falling into a tunnel vision mode. Mr. Pearce reiterated that his office's authority and resources were limited (the FAA and NASA had each contributed $5 million to the JPDO budget). For the short term, he thought that work would continue on track. Ideally, each agency would become heavily invested in its IPT(s), as well as dependent on fellow

agencies with respect to other system areas. Mr. Pearce still doubted, however, whether the JPDO's current level of authority would suffice when the stage was reached when individual agencies would have to change their way of doing business. One solution would be to give all resources to the JPDO as a program office for funding various activities across the agencies. Currently such an approach was not possible, but perhaps one day it could be. Adm. Wieringa suggested making a business case that spelled out the costs of the options. Mr. Anderson recommended having a single individual assume control over the output of the implementation teams and process. While conceding the ostensible efficiency of such an approach, Mr. Hertz argued that in practice it was not possible to designate a single individual or agency to do this. Not only were multiple agencies involved, but also several Congressional subcommittees and a panoply of system users would have to agree on one oversight entity. In the end, the Senior Policy Committee seemed a more promising vehicle for consensus and change.

Mr. Pearce continued his presentation by listing several items on the near-term calendar. The Executive Council of the REDAC would meet on October 1, 2004, and public comment sessions would take place on October 6-7. The Senior Policy Committee would convene shortly before the JPDO plan was to be submitted to the Office of Management and Budget (OMB) on November 1. Congress would receive the document by December 10. Meanwhile the roadmapping teams needed to formulate their 5-year budgets and complete their plans within the next 9 months. The IPTs would need to incorporate a wide range of input from the airlines and other system users.

Summing up, Mr. Pearce commented that much progress has been made but that some areas still required additional work. He had been encouraged by the active involvement of the FAA Administrator, who had reviewed the JPDO draft plan several times and commented in detail. Because of this investment of time, Mr. Pearce believed that the Department of Transportation had a strong commitment to make the plan successful.

Followup Discussion.
Gen. Hoover asked about the need for new JPDO staff. Mr. Pearce replied that additional personnel would include a Chief Architect and someone in program management. All together, the office would house 25-30 individuals (not including IPT members).

Joan Bauerlein noted that the Europeans had offered to help out with airspace transformation. They were making steady progress on their own front, in part because they did not have as many concerns about regulations.

Mr. Pearce reiterated his request for additional input from ARAC and from industry in general. Because of the upcoming Senior Policy Committee meeting in late October, he wanted to receive comments within the next week. Mr. Swanda commented that there had been little industry input until this stage, when the plan was largely developed. Mr. Pearce disagreed, but added that the plan would not succeed without the approval of industry and the user community. Mr. Swanda acknowledged that general aviation

manufacturers supported the general concept of the plan and simply desired to know more of the details.

Mr. Pearce concluded the discussion by reminding the committee that the draft plan represented a starting point, not an end point; much hard work remained. He also noted that the JPDO collaboration represented a political process, and because of that not everyone would be pleased with every outcome. Still, someone needed to take a stand and make the transformation happen.

Afternoon Session

Mr. Hertz's Overview of Aeronautics and Roadmapping

The first portion of Mr. Hertz's presentation focused on the distinctive environment within which ARMD operated relative to that of other agency components. In Space Operations, for example, the funder and the user were essestially the same—i.e., the Government. Although Aeronautics, too, was publicly supported, many of its users operated outside Government in the airframe and engine industries and other private-sector organizations. Consequently the directorate had to advance along two separate paths. In one role his office functioned as a technologist advocating programs for the public good; in another capacity Aeronautics collaborated with industry to develop capabilities that it could support. It was a difficult balance to maintain. If basic research generated too many unused products, ARMD could be criticized for "playing in the sandbox," Conversely, too much technology development for commercial exploitation might smack of corporate welfare. He suggested that perhaps the best way to finesse the conflict was to focus on taxpayers' needs and the functions that Government could inherently do best.

During a brief exchange, Dr. Brackey suggested that the concept of corporate welfare was a red herring. Dr. Gellman, however, argued that the term might well apply when an agency went beyond its legitimate roles in basic research and public safety and invested directly in technologies that would benefit one particular company or group of companies. Mr. Hertz said that vehicle programs posed the largest challenges of this sort. He thought that it would be inappropriate for NASA to develop technologies for a specific product already under commercial development, but that the agency could legitimately explore what the next generation of similar products might require.

Resuming his presentation, Mr. Hertz reviewed some of the figures alluded to earlier by Dr. Lebacqz, including the $85 million in Congressional earmarks. Mr. Hertz reported that his office could not find a mechanism within NASA to conduct the kind of peer review for earmarks that had been suggested earlier within both the agency and this committee. What Aeronautics did do was to request proposals for all site-specific earmarks for review by program staff. He was this as a step in the right direction, although every project that was proposed was subsequently funded. The House of Representatives appropriates bill contained $49 million in earmarks. Just over half that

amount was allocated for Propulsion 21, a coalition of government and university partners in Ohio. The Senate appropriated almost $40 million for special projects, but only $4 million for Propulsion 21; $25 million was set aside for hypersonics research. Discrepancies would have to be resolved in conference committee, where new earmarks were frequently added. These appropriations came on top of Aeronautics' existing budget but not that of the agency as a whole.

Mr. Hertz next turned to ARMD's Blueprint and roadmapping strategies. Three of NASA's strategic goals fed into this plan: enabling a safer, more efficient, and environmentally friendly air transportation system; contributing to a more secure world; and developing revolutionary technologies for use on this planet and possibly others. A set of target metrics for each objective had been enhanced by longer term metrics to establish a baseline. Mr. Hertz went on to describe how ARMD's roadmapping efforts tied into the agency's overall efforts in 13 different mission areas. Each mission directorate would enlist three cochairs—a NASA program officer, a field center director, and an external representative. For Aeronautics, Mr. Hertz would serve as the agency lead and Mr. Jamieson would represent the outside community. Rather than having one center director to fill the third leadership position, ARMD was asking all its center directors, plus the head of Ames, to work together in this capacity.

The presentation shifted to other sources of input for the roadmapping. Mr. Hertz noted that the new advisory committee structure would include three ARAC subcommittees, based on the three program areas, plus the Council of Deans. He suggested that the subcommittees could assist program managers with planning efforts. The JPDO could also help in this regard, as could workshops with industry. Finally, Aeronautics could benefit from the strategic assessment by the congressionally designated NASA Institute for Aerospace (NIA) at Langley.

Nothing the scope of the task and the 9-month timeframe to complete it, Mr. Anderson suggested that ARMD focus on the work that had already been accomplished by various working groups. Mr. Hertz agreed that much had already been achieved, particularly in Vehicle Systems, and that the output would be folded into the roadmap. In Airspace Systems, one more iteration of the JPDO plan would help refinement of the roadmap. Air safety and security also required more work. In addition, the components needed final integration before June so as to impact the FY 07 budget.

Mr. Hertz commented on the capability roadmaps that were being developed with the strategic plans. Unlike Space Operations, Aeronautics had many capabilities that resided outside the agency—e.g., with airframers. He thought it was important to recognize that a strictly NASA-owned capability roadmap for aeronautics would be ill-advised, just as a Government-only JPDO would e. What was needed was a national roadmap.

The presentation returned to the NIA study that Congress had funded with $5 million to develop a 5-year Aeronautics budget plan. Former Associate Administrator Bob Whitehead was leading this effort. The project had assembled a team of internationally recognized experts from academia and industry to establish the scope and priorities of the

research. Subteams would then assess technology priorities in various areas. A national plan integrator would use their output to produce a national plan for submission to Congress. Mr. Hertz said that Mr. Whitehead wanted to work from the future forward rather than rehashing the past. While Mr. Hertz would be consulted as necessary, Mr. Whitehead would otherwise work independently from ARMD.

Mr. Hertz concluded by quickly reviewing the observations of several external studies, especially that by the National Research Council (NRC), about the future of aviation. He noted a strong convergence among the findings about technical requirements in the field. What he was striving for in this context was an integrated approach.

Sherry Borener's Presentation on the Evaluation Working Group

As a follow-on to Mr. Hertz's overview of Aeronautics, Dr. Borener described he activities of the Evaluation Working Group (EWG) that she led. This team was developing a framework to calibrate system-level models of the national airspace, to assess safety and environmental impacts from changes in operations and vehicle mix, and determine where money should be spent. The team comprised representatives from the JPDO consortium, as well as other organizations with models and expertise to contribute.

Dr. Borener presented an evaluation diagram that showed how introducing alternative strategies into a model could affect various performance outcomes. For example, modelers could the traffic grow, fleet composition change, or business model shift, and then assess the consequences on the FAA Trust Fund or the economic yield of operators. This process could shed light on which options should never be licensed or certified. To illustrate the model in action, she displayed the baseline demand for a given day in 2002 relative to some future date with doubled demand. The scenario assumed that future passengers would fly on the same schedule as before. The doubling produced numerous areas of high overload and extensive delays, even when the assumptions of the Operational Evolution Plan (OEP) were incorporated. It became apparent that a fix required more than simply partitioning sectors and reallocating labor. To reduce delays, modelers made all runways independent of adjacent activity, but little advantage was gained. By doubling the en route air space capacity, however, delays fell to 32 minutes—far from ideal but significantly better than earlier.

Dr. Brackey raised questions about factoring safety into the equation. Dr. Borener replied that establishing a safety baseline could be difficult. She observed that safety modeling had two components: the micro level (workloads, performance analysis) and the system level. Unfortunately, the JPDO did not have a human factors team to focus on the micro level. Some coordination had been initiated, however, with organizations such as Ames that had expertise in human factors. With workloads, it might be useful to partition what was routine from what was exceptional; the controller could then delegate routine functions to an automated system and communicate with pilots only during exceptional events. Thus, workloads might change without compromising system safety. At the system level her team would model safety issues by perturbing the airspace network

relative to certain business models, airport sets, and growth trends, and then come to an air traffic management safety evaluation. The outcomes could provide collision probabilities.

Dr. Borener noted that 60,000 flights were incorporated into the baseline, which included some, but not all, general aviation activity. She said that the Government needed to decide how much to regulate general aviation and then to fund its integration into the system appropriately. In addition, she was interested in determining how the introduction of UAVs into the national airspace would affect flight scheduling.

The same type of analysis could be applied to environmental impacts such as noise, Dr. Borener continued. She said that resources expended on noise mitigation could be spent on aircraft replacement. When modelers ran scenarios with environmental output as the metric, they could gauge the potential pool of benefits from making changes in that domain. Similar benefits could also be derived regarding customer mobility or satisfaction. Dr. Borener displayed an array of factors that populated her team's experimental set. She noted that she was looking for orthogonal areas to evaluate as well.

Mr. Hertz returned to the microphone briefly to observe that the work of Dr. Borener and the EWG represented some of the most important and enduring accomplishments of the JPDO. He hoped to make use of the team during strategic planning activities within Aeronautics.

Robert Jacobsen's Presentation of Airspace Systems

Before beginning his presentation, Mr. Jacobsen commented on some remarks in the previous discussion. He suggested that the only way to meet the requirements of his program was to find a way for aircraft to operate independently on parallel runways and to develop technologies that could double the number of airplanes flying through en route sectors. Sensitivity studies could demonstrate the relative importance of these two factors. He also agreed with Gen. Hoover that civilian aviation needed a recognized requirements document to guide and legitimize system transformation; Mr. Jacobsen believed that the JPDO plan would serve that function.

The presentation itself began with videos that illustrated two different scales of the airspace system. One was a time-lapse representation of daily air traffic across the country and beyond. The second animation showed the passage of a coast-to-coast flight involving 23 control sector handoffs en route and 12 at the terminal areas. The first movie represented the strategic challenge, and the second depicted the tactical requirements. Both global and local factors figured in the pattern of flight delays. Although the problem subsided immediately after the September 11 terrorist attack, delays were once again on track to surpass 2001 levels in the near future. It was imperative for the country to address this issue so as to retain the ability to schedule air carriers.

Gen. Hoover asked whether NASA had a proven record of distributing products to the field. Mr. Jacobsen replied that the FAA had adopted two NASA tools in this regard,

although the technology transfer had been taken place outside normal channels (and therefore might not have been obvious). One of these had been the Traffic Management Advisor (TMA), perhaps the most successful tool developed by his office. This technology could optimize air traffic in and out of airports so as to minimize delays. TMA distributed predicted arrivals with enough lead time so that controllers knew how many minutes a given aircraft had to absorb in the air to maintain airport flow. Mr. Jacobsen showed various sites around the country where the technology had already been deployed or was being planned. Dr. Gellman suggested that TMA's success could be attributed as much to decreased stress among controllers as to technical advancement.

Turning to program structure, Mr. Jacobsen outlined several strategic focus areas: efficient traffic flow, system-wide operations technologies, and human factors. Much of the human factors area encompassed safety, an agency-wide concern. Ames offered considerable expertise in this area, and its recent administrative transfer to the Science Mission Directorate would not prevent Aeronautics from taking advantage of its remaining ties with that center.

The presentation shifted to the various projects, such as Efficient Aircraft Spacing (EAS), a joint undertaking with the FAA. EAS would develop solutions to safety challenges such as wake vortex, as well as airborne self-separation on transoceanic flights. Another project, Strategic Airspace Usage, would focus on communication, navigation, and surveillance (CNS) systems and the flow of traffic around major blockage areas, such as Chicago. Space-Based Technologies represented a new project being pursued through Glenn, in collaboration with the FAA and Eurocontrol, to develop a superior link capability with Europe. Meanwhile, the Small Aircraft Transportation System (SATS), while retaining its traditional linkage to general aviation, would evolve toward a program centered on underutilized airport technologies. (Although SATS would have no plan of work after FY 05, it would have a reserve fund for FY 06.) Finally, the Aviation Operations System project was becoming Human Measures and Performance, which would help define crew requirements on long-haul flights. Mr. Jacobsen noted that milestones for AATT, VAMS, SATS, and EAS had already been completed and documented. The total budget for all of Airspace Systems was $232 million for FY04 and $154 million for FY05.

Dr. Brackey asked how safety figured in the planning process for air traffic management. Mr. Jacobsen replied that safety was taken into account as a requirement for the FAA but that it was not a primary driver of his particular program; other units within Aeronautics provided that perspective. Dr. Brackey, however, argued that the emphasis on faster system throughput needed to be tempered with an explicit safety thrust and that NASA could take the lead in this matter. Mr. Hertz and Mr. Jacobsen agreed. Mr. Swanda, however, pointed out that studies consistently showed that the number of accidents caused by failures in air traffic control was extremely small and that perhaps NASA investments should be made accordingly.

At the end of the presentation, Mr. Swanda asked how much funding Mr. Jacobsen's program could spend appropriately should it become available. Dr. Shin replied that the

roadmapping process would yield a systematic view of budget priorities and that ARMD would reallocate resources among its three main programs if the outcomes suggested such a course of action. Mr. Jacobsen noted that his program had proposed a substantial augmentation that was currently in the hands of agency administrators.

Frank Jones' Presentation on Aviation Safety and Security

Mr. Jones began by outlining the origins of his program, which was born out of two commission reports one on safety and security and one on aviation gridlock. At the time, worldwide commercial aviation was losing one hull every 7-10 days, while general aviation was registering one fatal accident daily. The overall national goal of the new program was to reduce the aviation fatal accident rate by at least 50 percent (target: 80 percent) by 2007. The security component (to reduce aircraft vulnerability) was slated to kick in by 2009, and by 2012, the second phase of the safety program was expected to provide near-real time risk identification and resolution.

The overall program maintained five strategic focus areas divided among six projects, with safety and security having three projects each. The focus areas covered human error, system vulnerability, hostile acts, aircraft self-protection and preservation, and environmental hazards. Safety projects encompassed vehicles, overall system, and weather, while security projects looked at vulnerability detection and mitigation, as well as secure information flow.

Mr. Jones traced the research and development process, which progressed from portfolio definition through technology development to technology transfer. He said that it was necessary to understand the user's (the FAA's and industry's) needs, examine system metrics, and establish technology priorities. Understanding the business case for new technologies was particularly important. The basic challenge was customer cost avoidance: It was difficult to demonstrate the investment benefit of preventing something that *might* happen. Dr. Borener had been working with Volpe to assess the business case for various technologies. Aeronautics had also been gathering data and other input from the FAA, the air carriers, and the Commercial Aviation Safety Team (CAST). Fatality and site cleanup costs were receiving attention in the study. He assured Dr. Brackey that a referenced report on these issues would appear within a month or two, but said that he would still take any suggestions on the subject from the committee. Mr. Anderson suggested that the implicit business case resided in the need to avoid frequent front-page headlines about aircraft disasters. Mr. Jones said that ARMD was looking at the technical implementation risks of its 48 products and developing implementation strategies. If it could be shown that an air carrier could increase operations because of enhanced bad-weather vision, a convincing business case could justify new technology investment.

The presentation shifted to program partnerships. For example, a Joint Working Group from NASA and the FAA had been meeting semiannually and had developed an integrated safety research plan that was updated annually. During these sessions, NASA participants had benefited from the FCC's clarification of technology certification in areas such as synthetic vision. NASA has also developed ties with CAST, which

represented all the major international players. NASA was contributing to the Joint Safety Analysis Team. About half of Aviation Safety and Security research had been captured within CAST's nine research areas. Mr. Jones' program was also supporting CAST through the Performance Data Analysis and Reporting System (PDARS) and a survey of 24,000 commercial airline pilots about the effectiveness of the CAST safety plan (results should be available in January 2005). The PDARS output should allow CAST to determine whether its countermeasures to unstable approaches were working.

Mr. Jones noted that the National Aviation Operational Monitoring Service (NAOMS) funded at $500,000 to $800,000 annually represented one way to monitor and address runway incursions. There was no practical means to do this for all incidents, however. Part of the problem was the lack of a system for airlines to communicate with one another about the types of incidents that they were experiencing. NASA's intent for safety phase 2 was to collect more information from sources once they were freed from fear of punishment for disclosing data.

Mr. Jones continued his overview of the safety program by outlining various strategies such as synthetic vision in the cockpit of small aircraft, weather information devices, simulations, and flight test evaluations. He noted that pilots in general aviation generally preferred a wider field of view (60 degrees) relative to that in commercial aircraft. Object detection on the runway remained a challenge to synthetic vision technologies. Attention was also given to other developing capabilities, such as enhanced strength-to-weight ratios of blades and disks in jet engines.

As Mr. Jones turned to the security side of his program, several ARAC members questioned why NASA was forging ahead in this area. Why not let the security industry take the lead? Mr. Jones noted that NASA had the skills, world class facilities, and track record to develop the long-term technology that no one else was really pursuing. Mr. Hertz added that many efforts elsewhere were focusing on prevention; NASA, however, could pursue the intervention options. Dr. Gellman cautioned against blurring the line between safety and security, which he saw happening at TSA. Mr. Jones, however, pointed out that TSA was one of his customers and that broad issues of domain needed to be resolved at a higher level than his. Mr. Swanda suggested that attempts to develop refuse-to-crash technologies represented a waste of money. Mr. Hertz acknowledged the polarity of opinions on this subject. He said that DOD remained interested in this technology because at present, its last resort in a terrorist incident was to shoot down aircraft. Mr. Swanda recommended that the military itself should then fund the technology needed. Dr. Shin argued that such security measures made sense not only from a security standpoint, but also from NASA's charter.

Dr. Gellman pointed out that explosive detection systems did not receive mention in the presentation. Mr. Jones replied that his program was exploring advanced sensors for biological and chemical hazards.

Continuing his presentation, Mr. Jones described several future projects. In security, these included sophisticated technologies to mitigate an attack on aircraft through robust

use of controls, fuel protection systems, aircraft control, a security reporting system, monitoring of track deviations, and cargo air traffic screening. As for the future of safety projects, Mr. Jones reported on the outcome of a workshop series held earlier this year.

Over a 100 representatives from government and industry attended. The output included a portfolio of 58 recommended prioritized investments in 3 key areas: accident prevention, accident mitigation, and aviation systems monitoring and modeling.

The presentation concluded with a review of roadmapping activities. For the capability roadmaps, Mr. Jones' team was trying to develop 25-year strategies for the focus areas. Debates had emerged in several contexts, such as determining the number of pilots to serve as a benchmark for the integrated cockpit. (Mr. Swanda recommended that one pilot be the standard.) Mr. Anderson noted that time was short for developing the roadmaps. Mr. Hertz agreed that strategic planning in safety and security was not as far along as in the other program areas, but maintained that a foundation had already been laid, particularly as a result of the spring workshops.

Mr. Schlickenmaier's Presentation on Vehicle Systems

The presentation began with an overview of Vehicle Systems, which housed programs in Operations, Technology, and Strategy. Within this framework operated seven ongoing projects led out of ARMD's three research centers. Mr. Schlickenmaier described how this structure had emerged from NASA's Strategic Plan. He then outlined the key process elements for his technology investment strategy, which encompassed transportation system architectures, vehicle architectures, enabling technologies, and prioritization. The goal was to roadmap these elements beyond the current investment portfolio. The process had relied on strong collaboration with industry, academia, and other government organizations. He showed a triad model depicting the relationship among funders, users, and technologies, and then outlined the technology focus areas and objectives of his program. The objectives included protection of the environment, increased mobility, aerospace exploration, and partnership for national security. He also noted that the capability sets reflected vehicle sectors having more than a single-customer focus.

Gen. Hoover asked how a specific project e.g., subsonic or supersonic aircraft was carried out within the overall agency structure. Mr. Anderson, who had contributed extensively to Vehicle System plan development, described the normal process. He said that a concept vehicle lead operated out of one of the field centers but reported to managers at Headquarters. This individual functioned somewhat as a venture capitalist who was allocated a budget to invest at one of the centers to advance his/her objectives on a roadmap. The effort focused on developing a concept or vision, but with no guarantee of being ultimately implemented.

Mr. Schlickenmaier reported that in early 2004 a meeting with vehicle sector managers and technical project managers had taken place. At that gathering the venture capitalists had explored their purchase options. Although the roadmaps were originally unconstrained with respect to funding, the meeting participants knew their targets through

2020 and worked within their budgets. He said that he could supply additional information on the subject to Mr. Swanda, who had asked about budget constraints. Mr. Schlickenmaier also responded to Dr. Banerjee by noting that budgets had been allocated at the technical (rather than system) level. Mr. Schlickenmaier stated that he wanted to ensure that venture capitalists had the appropriate mix of technologies; then it was up to the technical project managers to execute the budget. Dr. Banerjee stressed the need to show how technology investments were influencing the different vehicle categories. Mr. Schlickenmaier replied that his office would be conducting such an exercise next year. Mr. Anderson expressed appreciation for all that had been accomplished in Vehicle Systems leading up to this year's workshop, but the plans seemed to call for more than three times the investment allocated in the agency budget. He also voiced concern that nothing appeared to have happened since the May meeting. Mr. Schlickenmaier said that implementation planning had in fact been proceeding internally.

Mr. Cappuccio emphasized the importance of working within the culture of the field centers. A test case would reveal whether a center could really deliver the promised technology to the venture capitalist within the prescribed timeframe. A successful outcome would remove the issue of center relevance from the table.

Resuming his presentation, Mr. Schlickenmaier showed how program managers had decomposed the planning process by starting from the President's management agenda and proceeding through NASA's own Strategic Plan. The process then advanced through the Vehicle Systems structure and roadmaps and shifted upward again through subproject plans, project deliverables, and Level 1 program plan. This approach represented a significant departure from R&T program development in previous years. Mr. Schlickenmaier also noted that an independent review group had plugged into the process in January 2004 and would meet again in January or February 2005.

Dr. Gellman initiated a discussion about provisions for protecting proprietary information generated from any of the Vehicle Systems projects. Dr. Brackey suggested that NASA did not seem to have a policy in place to address this matter, which would surely crop up assurance that their investments did not wind up benefiting competitors. Dr. Weber pointed out that this issue had surfaced with commercial payloads on the International Space Station and represented nothing new. Solutions were routinely worked out. Robert Mckinley of the Vehicle Systems Program agreed, saying that his office had a technology transfer plan already in use.

The discussion shifted to technology readiness levels (TRLs) in Aeronautics. Mr. Schlickenmaier indicated that technologies were often matured to TRL-6, which represented the traditional transfer point. He noted that the agency and industry did not always agree about the definition of this level. Mr. Swanda observed that other countries often developed products to higher levels before their commercial insertion. Dr. Brackey suggested that in Europe, such a tendency might reflect the need to demonstrate technologies there that had already been validated here (and might not need revalidation). Mr. Cappuccio predicted that NASA could not afford to take technologies much beyond TRL-6 because it usually represented a very expensive threshold i.e., flight

demonstrations. Dr. Gellman said that in Europe and Japan, many companies bought into technologies early in development. Mr. Cappuccio replied that companies doing this had to contend with a "dead zone" of inactivity before the technology took hold, which could be 5-10 years after the initial investment. He believed that Aeronautics was currently caught in such a zone and that the new roadmaps offered a way out.

Adm. Wieringer asked about steps being taken to weed out redundancy in Vehicle Systems. Mr. Anderson noted that in the Atlanta meeting, some duplication did crop up. He thought that the matter could be worked out. Mr. Hertz commented that this needed to be done across all of Aeronautics.

Mr. Schlickenmaier quickly concluded his presentation by running through various programs activities, such as EASI (aerodynamic fuel efficiency), ITAS (aircraft weight reduction), AuRA (autonomous control), VEET (clean-burning engines), LEAP (new energy sources), F&SD (flight validation), and VISTA planning. He then mentioned key next steps, including delivery of project and program documentation on October 1, nonadvocate review of program capability certification (end of October), and an external review in the summer of 2005. His office was also looking to implement a concept of foundation technologies representing as much as 20 percent of investments. It was possible that these technology projects would be peer-reviewed without a definite customer in mind.

Most of the followup discussion centered on flight certification. Mr. Swanda said it was a waste of time to do research that could not be certified by the FAA. He wanted to know how NASA prevented that from happening specifically, whether projects were required to live up to certification standards. Mr. Schlickenmaier replied that maintenance of a good relationship with the FAA partnership manager served as a check to this threat, although he conceded that a focus on certification was not applied uniformly. He said that it depended on the environment and timing. As the project progressed to a higher TRL, certification became more important. Dr. Brackey expressed concerned about deferring certification in this way, which could influence the way a technology was developed. Mr. Hertz replied that products, not technologies, were certified and that a focus on certification too early in development would stop as many products as start them.

At this point, the public session for the day came to an end, and the committee reconvened in a non-FACA session.

Thursday, September 30

Opening Remarks

After previewing the day's agenda, Dr. Lebacqz introduced Nicholas Altiero as the Chair of the new Council of Deans, which had become an official subcommittee of ARAC. DR. Lebacqz briefly described how Dean Altiero and Dr. Rediess were reengaging the engineering and science community on university campuses for Aeronautics and NASA.

Dean Altiero's Report on the Council of Deans
After touching on the council's membership, Dean Altiero noted that the group had met on September 10, 2004, and heard presentations from Dr. Lebacqz, Dr. Rediess, and Mr. Hertz. The council planned to convene semiannually in the future. The spring gathering would coincide with the Engineering Dean's Institute's annual meeting, which would take place in Tucson next April.

Dean Altiero alluded to four charter objectives of the council. Two of these solicited council recommendations and insights on strategic research and national trends. The remaining two emphasized the logistics of university interaction with NASA. Two council taskforces would reflect this strategic-tactical division. Joseph Cecchi of the University of New Mexico would chair the Strategic Taskforce, while Pradeep Kholsa would lead the Tactical Taskforce. These bodies would engage Dr. Rediess, who would provide any information to help them define issues and strategies. By the April meeting, the taskforces should be prepared to make recommendations to the full council, which would then report out to ARAC in the fall. The overall thrust of these efforts was to make working with NASA a more transparent process than in the past.

At the end of Dean Altiero's remarks, Dr. Rediess noted that Aeronautics was partnering in this effort with NASA's Office of Education, particularly Brad Weiner, Director of the Higher Education Program. He also mentioned that the directorate was establishing an aeronautics university research program council that would help the Council of deans develop a strategic plan. This additional body would include representatives from affiliated centers, the three program areas, and NASA's Office of Education.

Followup Discussion. Dr. Brackey expressed concern about workforce replacement and asked whether the council would speak principally to the agency's needs or address those of industry as well. Dean Altiero replied that council members at the meeting had recognized that their initial charge was to focus on NASA's requirements, although the group would undoubtedly take in the larger national picture over time. Gen. Hoover added that the disciplines involved were broader than aeronautics. Dean Altiero agreed. He also referred to the ongoing retirement of NASA's aging workforce and the imperative to offset the attrition. Mr. Anderson added that the same trends were operation in industry.

Mr. Cappuccio said he was dismayed by students from abroad who left the United States after their education only to compete against American aerospace companies at a later date. Dean Altiero observed that the numbers of foreign students often dominated graduate engineering programs, but that most of them eventually became U.S. citizens. He said that such programs would encounter serious problems if they attempted to recruit students only from a pool of American citizens.

Contrary to popular belief, interest in aerospace careers appeared to be on the upswing, Dean Altiero reported. This trend was noticeable not only on his campus, but also at other universities with different engineering curricula. Dr. Brackey and Mr. Anderson suggested that recent successes in space e.g., the mars rovers or the allure of planetary

vehicles might account for the resurgence. Dean Altiero said that this pattern turned up in faculty recruitment as well, with single vacancies attracting up to 200 applications. The qualifications of the new hires were quite impressive, although some later faced hardships like tenure loss because of their immigrant status and inability to secure grant funding from agencies like NASA, DOD, and the Department of Energy. A question arose about the ability of the academic engineering community to advocate effectively. Dean Altiero noted that the Engineering Deans Council of the ASEE had changed the landscape dramatically in this context. This group had become extremely proactive, convening a public policy forum in Washington and organizing State delegations to inform Congressional offices about the needs of engineering and science education, as well as industry. That was why it was important for the Council of Deans to link up with this organization.

Mr. Anderson asked about the mutually supportive partnerships mentioned in the first Council of Deans' objective. Dr. Rediess prelied that NASA had instituted various experimental partnership programs of late, such as URETIs and special university-linked institutes set up at Ames and Langley. It remained to be seen whether these approaches represented the best arrangements.

Dr. Brackey shifted the discussion to required skill levels for university graduates in engineering. Dean Altiero reported that during the last decade the Accreditation Board for Engineering and Technology had dramatically altered the validation process for higher education. No longer was it sufficient to compile lists of designated courses and hourly credits to retain accreditation. Today schools had to define a customer (employer) base, solicit customer input, set objectives, and measure outcomes. Deans regularly asked what their customers were looking for in graduates. Dean Altiero agreed with Mr. Anderson that university graduates needed to understand the concept of lifelong learning. The Internet and satellite campuses now facilitated this process. Many colleges contacted their alumni 5 years out to see whether they felt well prepared by their education for their jobs. Dean Altiero also observed that many university administrators did not share Dr. Brackey's concern about the decline in required credit hours or even the current 4-year standard for a baccalaureate degree. Their focus gravitated toward outcomes. It would be difficult, he suggested, for most schools to ratchet up to a 5-year requirement; they would risk losing out to competing institutions with the lower standard. Perhaps the highest tier of schools could take the lead, however, and the rest might follow. A second degree always remained an option.

Toward the end of the dialog, Dr. Gellman offered opinions on several different issues. One was academic tenure, which he argued represented an outmoded practice that posed antitrust problems for college administrators wishing to join forces against it. The second observation focused on the current university preoccupation with highway congestion rather than air traffic congestion. Finally, he called for engineering programs to train students to discriminate between work in the openly competitive private market and employment with companies supported by public contracts and cost-plus accounting.

Dr. Brackey concluded the discussion by suggesting that ARAC commend ARMD for having perceived the need to engage the university community more proactively.

Rebecca Gilchrist's Ethics Briefing

Representing NASA's Office of the General Counsel (OGE), Ms. Gilchrist began by defining the concept of Special Government Employee (SGE) and the obligations that it entailed. Specifically, an SGE was someone retained or appointed to serve in Government, with or without compensation, for up to 130 days in a year. She said that she assumed that all members of the ARAC fit this classification. Whenever an SGE performed his or her duties for the agency, they were bound by the same laws and regulations binding civil servants.

Ms. Gilchrist pointed out that SGE provisions fell under a criminal statute (identified by the numeral 18 in the U.S. Code). The law was designed to protect the integrity of the advisory committee's work. Conflict of interest represented the core of the ethics principles at stake. She said that SGEs should avoid representational activities before the Government whenever a conflicting interest arose among parties (i.e., to a specific contract, grant, or agreement). If such circumstances developed during a meeting (e.g., a specific contract of personal or professional significance came up), an SGEs should recuse him/herself from the discussion and the note taker should record the recusal. Ms. Gilchrist also noted that SGEs should not improperly use nonpublic information and should avoid even the appearance of impropriety.

To ensure committee integrity and flag potential problems, NASA's legal office required all SGEs to file an OBE-450, a confidential disclosure report, and to receive annual ethics training just as civil servants did. NASA's legal staff evaluated the disclosure forms against a large directory of contractors doing business with the agency. Holdings totaling less than $15,000 across all personal investments were not individually reviewed, although a report still needed to be filed. Mutual funds usually did not present a problem because they were normally so diverse. Any brokerage account like an IRA, 401k, or other investment whose assets the SGE controlled, however, should be fully identified. Financial scrutiny extended beyond personal financial interests to the interests of employers, spouses, and dependent children. It was important to fill out every answer slot on the disclosure form, even if the question did not apply. If significant holdings among NASA contractors did surface during review of the forms, NASA's legal staff would notify the SGE about the potential for conflict of interest in those cases.

Postemployment restriction in the U.S. Criminal Code permanently prohibited former employees from trying to influence the Government on behalf of another party with respect to a specific contract, grant, or agreement. Postemployment referred to the period after the SGE had stopped providing service to the agency. Mr. Anderson, noting that some of the company employees he supervised undoubtedly worked on NASA contracts, asked whether his ARAC membership posed a conflict of interest. Ms. Gilchrist said that a conflict would arise only if Mr. Anderson participated in committee discussion of particular contracts relevant to his company or if he divulged to his employees any

pertinent nonpublic information from the ARAC. If ARAC members never discussed specific contracts in their meetings, no conflict issues should ever arise.

Ms. Gilchrist next turned to the noncriminal standards of conduct with respect to gifts. Any item or service of value could be a gift a tangible present, transportation, or meal.

SGEs were prohibited from receiving gifts worth more than $20 individually or $50 cumulatively for the year. They should not offer to pay the difference between the value of the gift and the $20 limit. Attendance of large contractor receptions should not present a problem, although SGEs should check with her office in advance of the event to receive a legal determination. Any concerns about meals or other expenses covered by an SGE's employer could be taken up with the company itself.

Ms. Gilchrist reminded the ARAC that SGEs were subject to Hatch Act restrictions during periods of Government service. While committee members could freely engage in political activities within their private lives, they could not do so while working for the agency. This prohibition extended to all political advocacy, including buttons and posters.

At the end of her presentation, Ms. Gilchrist identified key personnel within her office, including General Counsel Michael Wholley and Andrew Falcon. NASA's field centers also had chief counsels who functioned as ethics officials. ARAC members could contact her office at ethicsteam@hq.nasa.gov.

Followup discussion. Gen. Hoover asked why SGE restrictions applied to ARAC members but not to the NAC membership. Ms. Gilchrist suggested that OGE had to determine whether a committee compromised SGE members or non-SGE representatives. A wholesale shift from one status to the other might invite an OGE audit. Mr. Green said that he saw value to retention of the SGE status for ARAC members. Dr. Brackey noted that one benefit of remaining an official SGE was the protection it offered as a shield against outside influence. Because of the administrative burden posed the status, however, Dr. Lebacqz indicated that he would quickly investigate any alternatives for ARAC members. Mr. Anderson noted that the postemployment SGE provisions would still apply even if members converted to another status.

Dr. Brackey asked whether the 130-day limit on SGE service applied to each committee membership or to all memberships on Government panels. Ms. Gilchrist said that she would need to check into that.

Joan Bauerlein's Update on the REDAC

Ms. Bauerlein began by describing current efforts to restructure the REDAC, a large formal body with less give and take than in the ARAC. She said that Vice Chair Jone Hansman, who presided at the plenary meetings, wanted the organization to become more strategic in focus and more spontaneous with respect to member input. Membership had expanded to include new representatives from airports and Lockheed-Martin.

Overall, she though the REDAC wanted more information about aviation research across the board. Although Mr. Hertz had made a presentation on this subject to the group, no one from the FAA had made a similar contribution. Charlie Keegan had reported on the JPDO, and the IPT leaders had given short reports at the spring meeting on what was happening in the eight team areas. The Air Traffic Subcommittee had established an ad hoc group to look at transferring technology into the operating environment. Ms. Bauerlein had worked on a report reviewing project technologies that had not been successfully transferred. She said that the REDAC needed to get a higher level view of the barriers keeping innovations from moving into the air traffic system. Ms. Bauerlein mentioned a few key dates on the calendar. The Air Traffic Subcommittee would meet in February, and the REDAC itself would convene April 12-13 at the FAA. As noted earlier, the joint REDAC-ARAC meeting was scheduled for September 20-21, 2005.

Several recent or impending staff changes at the FAA were noted during the presentation. Three vice presidents were leaving or had already left: Steve Brown, Jim Shearer, and Charlie Keegan.

Although informal relations between the FAA and NASA appeared better than ever, the formal relationship remained loosely defined. The old Executive Council had become inactive, leaving the JPDO as the principal ongoing venue for interagency collaboration. Dr. Lebacqz noted that 9 MOUs and 23 memoranda of agreement obtained between the agencies but that they did not provide a robust linkage. NASA liaison Chuck Johnson was working to replace these arrangements with a single agreement between the two Administrators and two MOUs between the FAA and NASA (one with Aeronautics and one with Exploration Systems). He and Ms. Bauerlein hoped that the new linkages would not upset the productive rapport now prevailing between the staffs of the two agencies.

In closing, Ms. Bauerlein noted that the FAA Administrator's Flight (strategic) Plan for FY 05 should now have appeared on the Web and that the Business plan for FY 05 should show up on the ATO Web site very soon.

Actions From Last Meeting

Dr. Lebacqz noted that his office felt obliged to respond to any formal recommendations from the ARAC, although not necessarily to its findings. For that reason he suggested that the committee offer specific, practical changes rather than unrealistic global ones.

Next, Dr. Lebacqz addressed each of the recommendations carried over from the March 24-25 meeting and included in a handout with agency responses. His remarks are summarized below:

- *NASA's leadership in aeronautics technology*. The agency was pursuing its vision of revolutionary new technologies and capabilities. JPDO and Vehicle Systems had advanced long-term plans; the Safety and Security roadmap still needed work, but stakeholders were being brought in so that

this task could be addressed as successfully as Vehicle Systems was. A new ARAC subcommittee on safety could help with this.

- *Gap between program funding and requirements for would leadership.* Although it would be unrealistic to expect overall funding for Aeronautics to increase significantly, Dr. Lebacqz offered comments on specific budget augmentation proposals:

    - Transformation of the national airspace remained the first priority of Aeronautics; a new augmentation initiative submitted to OMB last year, however was overwhelmed by the agency's shift toward space exploration.
    - High-altitude, long-endurance remotely operated vehicles were within guide for FY06. The directorate would add $20 million to vehicle technologies in this area (in addition to the $100 million investment in Access 5).
    - Next-generation clean aircraft power was part of the Vehicle Systems replanning effort, with money obtained from other areas.
    - Aviation security had generated two current projects, but it had been difficult at first to obtain the proper level of requirements and guidance from DHS; connections to that agency had since improved.
    - Quiet, safe rotorcraft received $15 million per year through the Vehicle Systems Program; this effort was focused on noise reduction and safety of large rotorcraft.
    - Accident reconstruction did not receive any funding from Aeronautics; six other Federal agencies already participated in this field.
    - Test and evaluation center reconfiguration had been placed on hold while the larger agency worked through an overall reorganization.
    - Overload supersonic cruise demonstrator did not have funding for flight, but the agency had allocated $16 million in FY 06 for supersonic noise reduction technologies
    - Hypersonics did not need further discussion at this point, given the previous day's exchanges.

- *Development of a DARPA-like approach within the agency.* Dr. Lebacqz knew of no activity in this area.

- *Institution of a peer review process for earmarks.* The agency did succeed in requiring proposal submission for earmarked projects, but in practice the thoroughness of the proposals and their review within the agency diminished over time. The agency's Chief Scientist's office was attempting to develop a more rigorous approach for next year.

- *Facilities management transformation.* This process was not as far along as Dr. Lebacqz had wanted, largely because of the reasons mentioned earlier. The directorate's new Mission Support Directorate would focus on this issue.

- *Maintenance of a robust university program.* The addition of the Council of Dean's and the appointment of Dr. Rediess spoke to this issue.

- *Gap between the roadmap for Aeronautics and the goal for world leadership.* Dr. Lebacqz indicated that he would convey the committee's concerns in this area to Dr. Elachi. By virtue of a FY 04 earmark, the NIA was also exploring gaps on a more near-term basis.

Followup Discussion. Dr. Gellman asked about the SATS project. Dr. Lebacqz said that he had become a believer in this project because it could demonstrate certain technologies fairly inexpensively. It could provide a model for other contexts. He agreed with Dr. Gellman that the agency's publicity claims in this area were sometimes misplaced. He noted that there would be a demonstration of SATS technology in June in Danville.

Mr. Cappuccio recalled that the issue of advisory committee input to Exploration Systems had surfaced after Adm. Steidle's briefing at the last meeting. Adm. Steidle had suggested that he did not sense an immediate need for technical guidance and that he would go to the NAC if he required any policy clarification. Mr. Cappuccio was wondering whether the ARAC could exert some influence over the development of research within Exploration Systems perhaps through low-TRL work at Langley. Dr. Lebacqz agreed with Mr. Cappuccio that Adm. Steidle was focusing on maturing the required technologies without necessarily looking at ancillary applications. Dr. Weber observed that regular updates from Exploration Systems might prove useful to the ARAC's deliberations. Dr. Lebacqz agreed, saying that he would try to arrange an hour or more of debriefing from that directorate on a regular basis fro ARAC meetings. A discussion ensued about the desired flow of information within such a debriefing; it could go both ways. Committee members agreed, however, that perceptions were important and that Adm. Steidle should not see this activity as a form of steering from the ARAC.

Recommendations and Discussions

At this time, Mr. Jamieson asked committee members to comment on anything in the morning's presentation or to make any recommendations for him to convey to the NAC. Mr. Cappuccio asked whether some form of tiger team approach should be established to confront the continuing workforce challenge in industry and its academic base. Dr. Brackey suggested that problem was not confined to the systems level and was showing up at the lower engineering level. Dr. Lebacqz commented that this seemed like an appropriate issue for the NAC to consider, considering the Administrator's interest in education as a mission.

Dr. Gellman spoke briefly about Europe's development of a primary satellite navigation system, which could be implemented as early as 2008. He also noted that European officials were reevaluating subsidies because they realized that their legacy airlines were being threatened by low-cost competition.

Dr. Brackey remarked on the solid initiative and leadership demonstrated by the JPDO but sensed that the ARAC continued to have concerns about its structure and plan for implementation.

Gen. Hoover raised the issue of the Ames administrative realignment and the potential for its aeronautics capabilities to atrophy. Dr. Lebacqz questioned whether anything could be done at this point about the structural change but thought that some of the impacts would be sorted out in assessments of the FFRDCs.

Dr. Weber expressed reservations about forwarding the roadmap issue to the NAC. She wanted to avoid any suggestion that Aeronautics had not been pursuing the right strategic path. Dr. Brackey replied that the intention of the message to the NAC was in fact to commend ARMD for using roadmapping as an effective planning tool.

Mr. Jamieson noted in closing that the legal issue of membership status SGEs versus representatives still required consideration at a higher level.

At this point Mr. Jamieson adjourned the meeting.

List of Attendees
Aeronautics Research Advisory Committee Meeting
September 29-30 2004

September 29

Subcommittee Members	
G. Michael Green, Executive Director	Jerry Seidel
James Jamieson, Chairman	Jaiwon Shin
Mark O. Anderson	Larry Spencer
Dev A. Banerjee	Dell Ricks
Joan W. Bauerlein	Jennifer Troxell
Thomas A. Brackey	NASA Headquarters
Frank J. Cappuccio	Boeing
Aaron J. Gellman	Boeing
William W. Hoover	Boeing
Ronald L. Swanda	FAA
Mary Ellen Weber	Boeing
Jeffrey A. Wieringa	Lockheed Martin
	Northwestern U.
NASA Staff	NAS
Rob Anderson	GAMA
Stephen Ballard	U. Texas
Sherry Borener	U.S. Navy
Jean Bianco	
Estelle Condon	
Terrence Hertz	NASA
Robert Jacobsen	NASA OER
Frank Jones	NASA
Gib Kirkham	NASA
Jenny Kishiyama	NASA
Victor Lebacqz	NASA HQ
Anita Liag	NASA
Mary-Ellen McGrath	NASA
Robert McKinley	NASA HQ
Jerry Newson	NASA
Robert Pearce	NASA HQ
George Price	NASA GRC
Herman Rediess	NASA HQ
Herb Schlickenmaier	NASA
A. Schra	NASA

NASA HQ	NASA HQ
NASA HQ	NASA HQ
NASA HQ	NASA
NASA HQ	NASA
NASA	NASA

Other Participants

Ed Fedderab	
Frank Messina	NASA Headquarters
Frank Morring	Boeing
Jaspar Thomson	Tulane U.
Tony Tolouse	Boeing
	FAA

September 30

	Boeing
	Lockheed Martin

Subcommittee Members

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